Teaching the pedagogical content knowledge of astronomy with a learning management system

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The overall framework (1/2)

• Early childhood teachers:

- are not science specialists,
- do not display sufficient content knowledge in science,
- do not feel confident to ask the right questions and interpret children's answers in a way that leads to the scaffolding of the natural sciences activities.

• Early childhood teachers' knowledge on how to approach astronomical phenomena is quite limited.

• Need for a professional development course.

• We focus on the development of an open online course on teaching astronomy in early years.

• This course is built on the Learning Management System (LMS) Moodle.

The overall framework (2/2)

- Resources are multimodal combining video with pictures, sound, movement.

- The present case study contributes to our knowledge about the use of ICT in the professional development and in-service training courses for teachers.

- Teachers find difficulties in using technology, so the study is focusing not only on the development of the learning tools and but also on the learning processes and the development of support so that teachers fully exploit the LMS.

Theoretical framework (1/4)

- Ertmer (2005) argued that teachers are likely to think about technology in the same way they think about other educational innovations.

- Consequently, examining how teachers approach innovations and what makes Professional Development (PD) programs effective might help understand teachers' response to PD on ICT integration in the classroom.

- The study is designed as a case study in an attempt to understand how early childhood teachers responded to an in-service PD program on astronomy.

- In this multiple case study design, each teacher is treated as a separate case in order to determine common underlying patterns.

Theoretical framework (2/4)

• One promising method of promoting conceptual change in science learning is inquiry-based (or discovery-based) learning (Hofstein & Lunetta, 2004; de Jong, 2006).

• Therefore, learning of complex science issues such as astronomy often requires not only acquisition of new knowledge, but also changes in early childhood teachers' deeply entrenched intuitive conceptions.

• The real value of e-learning should not only be based on its ability to train just anyone, anytime, anywhere, but also on the opportunity it offers to train the learners to conceptualize scientific issues and principles at the right time.

• This pedagogical methodology has to be in alignment with the constructivist model of learning (Martin-Blas & Serrano-Fernandez, 2009).

Theoretical framework (3/4)

• Dougiamas and Taylor (2003) bring forward the importance of the social constructivist framework in developing LMS.

• Moodle relies on a strong pedagogical foundation creating a new trend to the education system (Katsamani, Retalis & Boloudakis, 2012).

• Moodle has been used as a LMS platform for sharing useful information, documentation, and knowledge management in research projects, yielding important benefits to the researchers
(Uribe-Tirado, Melgar-Estrada & Bornacelly-Castro, 2007; Blas & Serrano 2009; Katsamani, Retalis & Boloudakis, 2012).

Theoretical framework (4/4)

• A well-prepared workforce is a critical component of high quality early childhood education (Buysse and Hollingsworth 2009),
as it is early childhood personnel who implement the classroom practices and interactions that promote positive cognitive and social outcomes for children in their first years (Peisner-Feinberg et al. 2001).

• The literature suggests that effective personnel preparation is:

(1) focused on specific instructional strategies rather than general content;

(2) connected with program standards, curricula, and assessments; and

(3) infused with active learning opportunities, guided practice, and corrective feedback
(Darling-Hammond et al. 2009; Snyder et al. 2011; Zaslow et al. 2010).

The three dimension of the educational activity

1

Face to Face

Instruction and Collaboration

2

Learning Management System, LMS

Retrieval of polymorphic teaching material

http://schedu.teicrete.gr/moodle/course/

Teaching Astronomy to early childhood teachers

3

Social Media

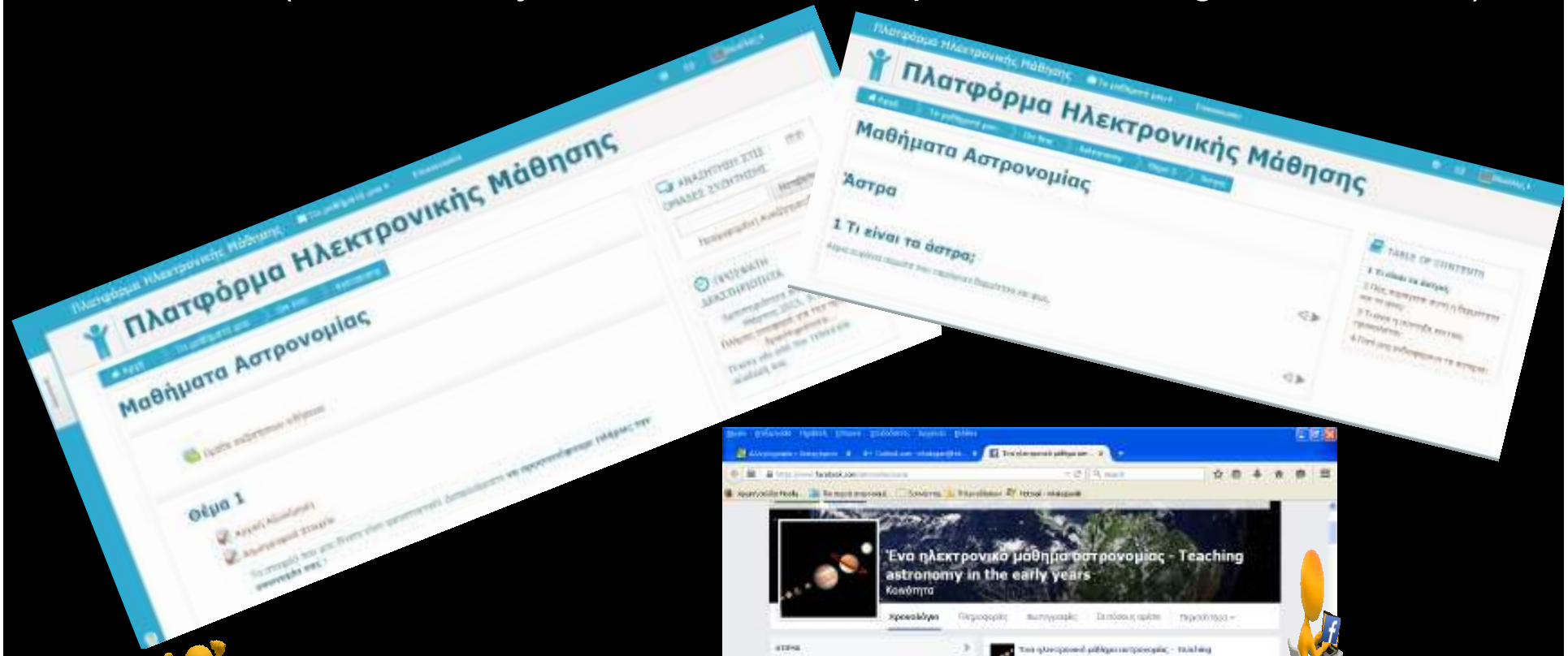
Links - Coordination

Facebook

https://www.facebook.com/astronomycourse

LMS (Moodle) vs Facebook vs Astronomy

MOODLE (**M**odular **O**bject **O**riented **D**evelopment **L**earning **E**nvironment)



http://schedu.teicrete.gr/moodle/course

The philosophy of the LMS

- (a) place an emphasis in process-oriented learning,
- (b) encourage the use of modeling, demonstration, explanation and questioning into a co-constructive interaction
- (c) identify the meaningful connections between concepts, theories and scientific ideas that lead to curriculum integration and holistic learning
- (d) emphasize the engagement in crosscutting concepts such as size, scale, and perspective, which enable multileveled learning (Plummer 2014).

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The learning design (LD) process

• The LD process, involves a number of steps such as:

- the specification of the learning activities needs to be performed by human actors (e.g. learners and tutors) in order to achieve the learning objectives,

- the orchestration of the learning activities, i.e. the sequence of the specified learning activities as well as the identification of the learning resources and services that need to be used in order to support the learning activities (Koper, 2005).

Moodle environment

Methodological issues

• Due to the nature and focus of the study, many different types of data will be collected in the LMS.

We draw on the following data sources:

• **(a)** Instructional scenarios.

• **(b)** Group discussions.

• **(c)** Revised instructional scenarios.

• **(d)** Participant observations and field notes.

Research Questions

- Given the design challenge of creating instructional scenarios about astronomy, implementing them in their classrooms, reflecting on them in the context of the PD, and then revising their initial instructional scenarios the following research questions are addressed:

- **1.** How did the early childhood teachers integrate astronomy in their designs?

- **2.** What were the early childhood teachers' reflections on their designs?

- **3.** How did the early childhood teachers revise their initial designs?

Instructors in Moodle

- Instructors should act as *"knowledge mediators"* to support acquisition and application of knowledge and skills.

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Thank you!

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